Distributed Energy Resources

Funding Profile by Subprogram[a]

(dollars in thousands)

	FY 2004 Comparable Appropriation	FY 2005 Comparable Appropriation[b]	FY 2006 Base	FY 2006 Request	FY 2006 Request vs Base	
					$ Change	% Change
Distributed Energy Resources						
Distributed Generation Technology Development	39,497	39,322	39,322	35,485	-3,837	-9.8%
End-Use System Integration and Interface	19,676	20,571	20,571	20,500	-71	-0.3%
Technical/Program Management Support	511	523	523	644	+121	+23.1%
Total, Distributed Energy Resources	59,684	60,416	60,416	56,629	-3,787	-6.3%

Public Law Authorizations:

P.L. 94-163, "Energy Policy and Conservation Act" (1975)
P.L. 94-385, "Energy Conservation and Production Act" (1976)
P.L. 95-91, "Department of Energy Organization Act" (1977)

Mission

The mission of the Distributed Energy Resources (DER) Program is to strengthen America's aging energy infrastructure and provide utilities and consumers with a greater array of energy efficient technology choices for the on-site generation of electricity and wasted thermal energy. By 2015, the Distributed Energy Resources Program will develop and deploy a diverse array of high efficiency integrated distributed generation and thermal energy technologies at market competitive prices so that homes, businesses, industry, communities, and electricity companies elect to use them.

Benefits

The Distributed Energy Resources Program supports DOE's mission of advancing the national, economic, and energy security of the United States. The program helps protect our national and economic security by promoting a diverse supply and delivery of reliable, affordable, and environmentally sound energy systems. Distributed energy technologies can expand the use of our Nation's aging electricity power infrastructure, relieve congestion on transmission and distribution

[a] SBIR/STTR funding in the amount of $1,326,000 was transferred to the Science Appropriation in FY 2004. Estimates for SBIR/STTR budgeted in FY 2005 and FY 2006 are $1,347,000 and $1,256,000 respectively.
[b] Reflects the 0.594% and 0.80% rescissions of -$365,000 and -$489,000 respectively and comparability adjustment for National Energy Technology Laboratory Support of -$210,000.

systems, increase supplies during periods of peak demand, support the transition from traditional monopoly regulation to more competitive markets and reduce environmental emissions, including greenhouse gases. Additionally, consumers should have a choice between installing on-site generation and/or electricity provided by central station generators. Consumers (or third party owners such as utilities or energy service providers) install these systems to reduce their energy costs, enhance energy security and/or improve the reliability and quality of energy services they receive from the local utility. Distributed energy devices can sustain "mission-critical" operations when grid-connected power is not available or not sufficient. Local utilities are looking to distributed energy systems to improve the utilization of distribution assets by reducing the peak or altering the shape of energy demand. One of the recent benefits to come from this research is the demonstration of a 42 percent efficient reciprocating engine by Caterpillar Incorporated and the commercial introduction of the Semco desiccant system. Likewise, SEMCO, Incorporated has commercially introduced an Integrated Active Desiccant Rooftop (IADR) unit that allows precise temperature and humidity control in restaurants, schools, movie theatres, and other specialized commercial and institutional markets. Currently, most rooftop air conditioning units cannot adequately dehumidify the increased volume of fresh air required for healthy, modern buildings. Uncontrolled, increased humidity levels result in building occupants lowering thermostat set-points to maintain comfort and increased risk of mold growth and poor indoor air quality. The IADR efficiently dehumidifies air and is regenerated by waste heat. The product is being commercialized as Revolution.™ And lastly, Burns & McDonnell has installed an Integrated Energy Systems (IES) at Austin Energy that incorporates a Solar Turbine (Taurus 60) and a Broad Chiller. This was the first project to put both the turbine and chiller on connecting skids with one set of integrated controls and auxiliary equipment.

Strategic and Program Goals

The Department's Strategic Plan identifies four strategic goals (one each for defense, energy, science, and environmental aspects of the mission) plus seven general goals that tie to the strategic goals. The DER Program supports the following goal:

Energy Strategic Goal: To protect our national and economic security by reducing imports and promoting a diverse supply of reliable, affordable, and environmentally sound energy.

General Goal 4, Energy Security: Improve energy security by developing technologies that foster a diverse supply of reliable, affordable and environmentally sound energy by providing for reliable delivery of energy, guarding against energy emergencies, exploring advanced technologies that make a fundamental improvement in our mix of energy options, and improving energy efficiency.

The DER Program has one program goal which contributes to General Goal 4 in the "goal cascade":

Program Goal 04.59.00.00: Distributed Energy Resources. The Distributed Energy Resources Program goal is to develop a diverse array of cost competitive integrated distributed generation and thermal energy technologies and facilitate market adoption in homes, businesses, industry, communities, and electricity companies, increasing the efficiency of electricity generation, delivery, and use, improving electricity reliability, and reducing environmental impacts.

Contribution to Program Goal 04.59.00.00: (Distributed Energy Resources)

The key contribution of the Distributed Energy Resources Program to the energy security goal is through improving energy efficiency of distributed power systems, directly reducing demand for natural gas and increasing the reliability and flexibility of the electric grid. Distributed Generation Technology research advances the development of more efficient, low emission distributed power generation technologies. End-Use Systems Integration and Interface activities combine efficient power generation technologies with thermally activated heating and cooling applications that further enhance on-site efficiency.

The subprogram activities presented below demonstrate key technology pathways that contribute to achievement of these benefits:

- By 2008, the Distributed Generation Technology Development activities will contribute to the program goal by completing development of a portfolio of distributed generation and thermally activated technologies that show an average 25 percent increase in efficiency (compared to 2000 baseline) and NO_x emissions less than 0.15 lbs/MWh, with an equivalent reduction in cost versus comparable technologies.

- By 2008, the End-Use System Integration and Interface activities will contribute to the program goal by developing the feasibility of integrated systems; these systems will achieve 70 percent efficiency and customer payback in less than 4 years, assuming commercial-scale production, in which one is developed by 2005 and three are developed by 2008.

Annual Performance Results and Targets

FY 2001 Results	FY 2002 Results	FY 2003 Results	FY 2004 Results	FY 2005 Targets	FY 2006 Targets
Program Goal 04.59.00.00 (Distributed Energy Resources)					
Distributed Energy Resources/Distributed Generation Technology Development					
Complete 5,000 durability, performance, and emissions testing of the Mercury 50 Advanced Turbine System engine.		Complete 4,000 hour field test of ceramic composite shroud components to demonstrate performance and emission benefits to a gas turbine. [MET]	Complete final design and initiate field testing of low emission technology with less than 7 ppm NO_x. [MET]	Demonstrate NO_x emission levels of 0.25 lbs/MWh from a turbine combustion system.	Demonstrate a prototype 35 percent efficient microturbine system.
		Complete the 12 Beta field test units of high efficiency natural gas-fired heat pump (60 percent better than pulse combustion furnace) and install at field test sites hosted by major U.S. Gas Utilities. [MET]	Complete and demonstrate heating coefficient of performance of 1.4 for commercial introduction of a thermally activated system (approximately 40 percent more efficient than a conventional heating system). [MET]		
		Contract with three companies to support research on demonstrating a 5 percent increase in efficiency for an advanced microturbine. [MET]			
			Demonstrate 6 percentage point increase in efficiency for an advanced reciprocating engine. [MET]		
Distributed Energy Resources/End-Use Systems Integration and Interface					
	Demonstrate a microturbine package (highly efficient for reducing peak loads) at a university site.		Complete final design and initiate field testing and evaluation of a complete, fully functional integrated CHP system consisting of a turbine, absorption chiller and control system. [MET]	Complete a case study on a CHP installation that uses heat from a microturbine to provide plate tank heating and sludge drying at an industrial facility, contributing to the PART long-term measure of developing a 70 percent efficient CHP integrated system.	Develop one packaged CHP system which operates at 70+% efficiency.
				Complete and document two DER/CHP demonstration projects within the high tech industry, contributing to the PART long-term measure of developing a 70 percent	

FY 2001 Results	FY 2002 Results	FY 2003 Results	FY 2004 Results	FY 2005 Targets	FY 2006 Targets
				efficient CHP integrated system.	
			Contribute proportionately to EERE's corporate goal of reducing corporate and program uncosteds to a range of 20-25 percent by reducing program annual uncosteds by 10 percent in 2004 relative to the program uncosted baseline (in 2003) until the target range is met.	*Contribute proportionately to EERE's corporate goal of reducing corporate and program adjusted uncosted obligated balances to a range of 20-25 percent by reducing program annual adjusted uncosteds by 10 percent in 2005 relative to the program FY 2004 end of year adjusted uncosted baseline ($21,257K) until the target range is met.*	*Contribute proportionately to EERE's corporate goal of reducing corporate and program adjusted uncosteds to a range of 20-25 percent by reducing program annual uncosteds by 10 percent in 2006 relative to the program uncosted baseline (2005) until the target range is met.* *Maintain total Program Direction costs in relation to total Program costs in the range of 8% - 12% to demonstrate efficient and effective EERE-wide business and technical support to mission direct programs.*

Means and Strategies

The Distributed Energy Resources Program will use various means and strategies to achieve its program goals as described below. "Means" include operational processes, resources, information, and the development of technologies, and "strategies" include program, policy, management and legislative initiatives and approaches. Various external factors, as listed below, may impact the ability to achieve the program's goals. Collaborations are integral to the planned investments, means and strategies, and to addressing external factors.

The Distributed Energy Resources Program uses several means (processes, technologies, and resources), and program, policy, management and market-based strategic approaches to achieve its program goals. The program goals and intended impacts are particularly sensitive to external factors outside its control. Collaboration with industry and experts are integral to achieving the investments, means and strategies planned and to addressing the external factors.

The Distributed Energy Resources program will implement the program through the following means:

- By advancing performance and reducing technology cost of integrated energy systems including: increasing materials durability, utilizing waste heat, improving the efficiency and emissions of combustion systems, and improving advanced controls; and
- By supporting the integration of distributed energy technologies on the distribution system and at customer's sites to achieve the maximum efficiency, reliability, power quality and load management.

The Distributed Energy Resources program will implement the program through the following strategies:

- Investigate responsive load issues to help customers understand load management;
- Provide the technical basis to develop standards for sitting/permitting/interconnection procedures;
- Work to provide the technical basis to develop rate and cost transparency in the generation and delivery of electricity (including fair and reasonable standby/backup rates);
- Expand utility business strategies to include distributed technologies as a tool to support the distribution system;
- Educate potential customers, utilities, regulators, and the public on the value of heating/cooling in combined heat and power systems;
- Advance the ability of technologies to be dual fueled, and
- Collaborating with the U.S. Environmental Protection Agency (Interagency Agreement) on education and outreach efforts to address environmental sitting and permitting of combined heat and power (CHP) and other distributed energy devices through the EPA CHP Partnership.

These strategies will result in significant cost savings and a significant improvement in the utility's load demand profile from large blocks of central generation and transmission and distribution investments − thus putting the taxpayer's dollars to more productive use.

The following external factors could affect the Distributed Energy Resources Program's ability to achieve its strategic goal:

- The state of the electric sector economy including utilities, transmission and distribution companies, electric suppliers, and manufacturers;
- The fiscal state of the economy to give consumers the ability to finance distributed energy technologies;
- Utility rate structure and regulatory environment that will effect (potentially stifle) customers' ability to choose and install distributed energy systems in a timely and cost-effective manner without changes to existing barriers;
- The pace of development in alternative energy supply technology; and
- The price of energy inputs, primarily natural gas.

In carrying out the program's mission, the Distributed Energy Resources Program performs the following collaborative activities:

- The program operates a comprehensive set of research development and demonstration partnerships including competitively awarded cost-shared projects;
- Federal partnerships include participation with the Federal Energy Management Program (FEMP) to promote and install distributed energy systems at Federal facilities;
- The program supports Hydrogen, Fuel Cells, and Infrastructure Technologies Program by developing technologies that can use hydrogen based fuels for electricity generation or cooling, heating and power applications;
- The program coordinates with the Industrial Technologies Program and Building Technologies Program to identify co-funding projects that involve the use of distributed energy systems in manufacturing plants and commercial/residential buildings;
- The program works with the State Energy Program- Special Projects to increase awareness, promote benefits, and remove barriers to distributed energy;
- Small businesses are supported through the Small Business Innovation Research Program;
- The program also partners (leveraging cost share and technical reviewers) with the California Energy Commission and the New York State Energy Research and Development Authority on distributed generation and CHP research.

Validation and Verification

To validate and verify program performance, the DER Program conducts internal and external reviews and audits. A program peer review was held in December 2003. The purpose of the peer review was to assess the mission, goals, objectives, strategy, program balance, leadership and productivity of the Distributed Energy Program. This peer review evaluated all aspects of the program technology and provided comments to the Department which have been used to develop outyear plans. The peer review Executive Summary is available online at the DER website www.eere.energy.gov/de/.

The next program peer review will be held in the Fall 2005.

Data Sources: The Energy Information Administration's (EIA) Annual Energy Review and Annual Energy Outlook, EIA Form 860 data analyzed by the Resource Dynamics Corporation, Merit Review and Peer Evaluation of R&D, and engineering and economic modeling

Baselines: The following are the key baselines used in the Distributed Energy Resources Program (for the year 2000, unless otherwise noted):

- Industrial Turbines emissions: 0.35 (lb/MWh)
- Microturbines emissions: 0.7 (lb/MWh)
- Reciprocating Engines emissions: 3.1 (lb/MWh)
- Industrial Turbines efficiency: 39 percent (2001)
- Microturbines efficiency: 26 percent
- Reciprocating Engines efficiency: 36 percent
- Technologies with 70% efficiency, with less than 0.15 lbs./MWh and a payback of 4 years or less on production volumes (2003): 0.

Frequency: GPRA benefits are estimated annually; Merit Review and internal review of projects are evaluated annually; and the Program Peer Review is conducted biennially.

Evaluation: In carrying out the program's mission, the DER Program uses several forms of evaluation to assess progress and to promote program improvement.

- Technology validation and operational field measurement, as appropriate
- Peer review by independent outside experts of both the program and subprogram portfolios
- Annual internal Technical Program Review of the DER Program
- Specialized program evaluation studies to examine process, impacts, or market baseline and effects, as appropriate
- Quarterly and annual assessment of program and management results based performance through Joule (the DOE quarterly performance progress review of budget targets), R&DIC (annual internal review of performance planning and management of R&D programs against specific criteria), PMA (the Presidents Management Agenda -- annual departmental and PSO based goals whose milestones are planned, reported and reviewed quarterly) and PART (common government wide program/OMB reviews of management and results).
- Annual review of methods, and recomputation of potential benefits for the Government Performance and Results Act (GPRA)

Data Storage: EE Corporate Planning System

Verification: A trade association working group reviews DER data. The November 2001 Distributed Energy Resources Peer Review verified the distributed generation data. Merit reviews and peer evaluations by experts from outside of the U.S Department of Energy are used to evaluate individual project and overall program efforts.

Within these peer reviews, DER experts review each project. Principles of the Administration's R&D Investment Criteria for research have been incorporated into this evaluation. The panel also evaluates the strengths and weaknesses of each project and recommends additions or deletions to the scope of work. As an example of this application of the R&D criteria, the Program is closing out the recuperator development project, within the Microturbines activity, as the research has reached the transition point wherein any further development of this technology is now within the capability of industry. As well, the Program has increased funding for the Distributed Energy Systems Applications Integration activity, as the new research will advance building cooling, heating and power integration systems research which builds upon existing technology and complements related R&D activities. The program organization facilitates supplier-customer relationships to ensure that R&D results from federally sponsored efforts are transferred to industry suppliers and that industry supplier developments make their way to the energy market. Annual targets will be verified using published research reports and other auditable information sources.

Program Assessment Rating Tool (PART)

The Department implemented a tool to evaluate selected programs. PART was developed by OMB to provide a standardized way to assess the effectiveness of the Federal Government's portfolio of programs. The structured framework of the PART provides a means through which programs can assess their activities differently than through traditional reviews. The DER Program has incorporated feedback from OMB into the FY 2006 Budget Request and has taken or will take the necessary steps to continue to improve performance.

The FY 2005 PART review included strong ratings for purpose, planning, and management. These ratings reflect the commitment of EERE program management at all levels to the basic management and planning principles of the President's Management Agenda including the criteria scored in the PART and the implementation of the EERE reorganization employing those principles. The PART recommended that the program develop performance measures to account for outreach activities and that the program focus R&D funding on systems integration while decreasing emphasis on component technology R&D that is within industry's capability. In response to the recommendations from the PART review, the DER Program is in negotiations with OMB to develop a measure to account for outreach activities and has increased its funding for system integration efforts, particularly in the component technology research in the Distributed Energy System Applications Integration activity. The PART also recommended that the Department develop a consistent framework to analyze the costs and benefits of its R&D investments to inform budget decisions. These efforts are underway.

The PART also recommended that the program participate in the development of a consistent framework for the Department to analyze the costs and benefits of its R&D investments, and apply this guidance to development of the FY 2006 budget. The program has provided input the Department needs to improve consistency in the methods and assumptions used to estimate potential benefits. The Department is employing the data in its effort to produce comparable estimates within its energy R&D programs to inform budget decision. EERE is working with OMB, the other applied R & D programs, and the PMA Budget and Performance Integration principals in the department to establish an increasingly integrated and consistent framework to inform the budget process.

Funding by General and Program Goal

	(dollars in thousands)		
	FY 2004	FY 2005	FY 2006
General Goal 4, Energy Security			
Program Goal 04.59.00.00, Distributed Energy Resources			
Distributed Generation Technology Development	39,497	39,322	35,485
End-Use System Integration and Interface	19,676	20,571	20,500
Technical/Program Management Support....................	511	523	644
Total, Program Goal 04.59.00.00, Distributed Energy Resources..	59,684	60,416	56,629
Total, General Goal 4 (Distributed Energy Resources)........	59,684	60,416	56,629

Expected Program Outcomes

The DER Program pursues its mission through integrated activities designed to improve the energy efficiency and productivity of our economy, as well as providing opportunities for local development of domestic renewable resources. We expect these improvements to reduce susceptibility to energy price fluctuations and potentially lower energy bills; reduce EPA criteria and other pollutants; enhance energy security by increasing the production and diversity of domestic fuel supplies; and provide greater energy security and reliability by improving our energy infrastructure. In addition to these "EERE business-as-usual" benefits, realizing the DER Program goals will provide the technical potential to reduce conventional energy use even further through increased efficiency.

Estimates of annual non-renewable energy savings, energy expenditure savings, carbon emission reductions, natural gas savings, and distributed electricity capacity additions that result from the realization of DER Program goals are shown in the table below through 2025. Not all kilowatt-hours (kWh) of electricity have equal value to consumers. Market experience suggests that at least a portion of consumers are willing to pay more for electricity that is more reliable, of higher quality, locally controllable, available during emergency, and/or cleaner. As well, these distributed technologies may be useful in meeting local clean air attainment requirements. As a result, these benefit estimates are likely based on an underestimate of the demand for these products under baseline market assumptions. In addition, these estimates do not account for the synergies between improved DER technologies and end-use applications of those technologies being developed by other EERE programs.

The assumptions and methods underlying the modeling efforts have significant impact on the estimated benefits, and results could vary significantly if external factors, such as future energy prices, differ from the "baseline case" assumed for this analysis. EERE's baseline case is essentially the same as the EIA "business-as-usual" case presented in its Annual Energy Outlook. In addition, possible changes in public policy and disruptions in the energy system which may affect estimated benefits are not modeled. The external factors such as unexpected changes in competing technology costs, identified in the Means and Strategies section above, could also affect the Program's ability to achieve its goals.

The results shown in the long term benefits tables are preliminary estimates based on initial modeling of some of the possible program production technologies; nonetheless, they provide a useful picture of the potential change in national benefits over time if the technology, infrastructure and markets evolve as expected. Estimated benefits which follow assume that individual technology plans and market assumptions obtain. Final documentation is estimated to be completed and posted by March 31, 2005. Uncertainties are larger for longer term estimates. A summary of the methods, assumptions, and models used in developing these benefit estimates that are important for understanding these results are provided at www.eere.energy.gov/office_eere/budget_gpra.html.

FY 2006 GPRA Benefits Estimates for the Distributed Energy Resources Program[a]

Mid-Term Benefits[b]	2010	2015	2020	2025
Primary nonrenewable energy savings (Quads)	0.08	0.13	0.28	0.25
Carbon emission reductions (MMTCE)	2	6	12	11
Natural gas savings (Quads)	-0.01	-0.21	-0.42	-0.42
Program specific electric capacity (GW)	7	34	53	64

[a] Benefits reported are annual, not cumulative, for the year given. Estimates reflect the benefits expected from program goals based on the program activities that would be possible at levels consistent with assumptions in the FY 2006 Budget..
[b] Mid-term program benefits were estimated utilizing the GPRA06-NEMS model, based on the Energy Information Administration's (EIA) National Energy Modeling System (NEMS) and utilizing the EIA's Annual Energy Outlook (AEO) 2004 Reference Case.

Distributed Generation Technology Development

Funding Schedule by Activity

(dollars in thousands)

	FY 2004	FY 2005	FY 2006	$ Change	% Change
Distributed Generation Technology Development					
Industrial Gas Turbines	3,950	2,958	2,500	-458	-15.5%
Microturbines	6,704	6,201	5,685	-516	-8.3%
Advanced Reciprocating Engines	13,408	13,608	10,000	-3,608	-26.5%
Technology Based – Advanced Materials and Sensors	7,999	9,150	8,300	-850	-9.3%
Fuel Combustion (formerly Fuel Flexibility)	0	739	1,000	+261	+35.3%
Thermal Energy Technologies (formerly Thermally Activated Technologies)	7,436	6,666	8,000	+1,334	+20.0%
Total, Distributed Generation Technology Development	39,497	39,322	35,485	-3,837	-9.8%

Description

The mission of the Distributed Generation Technology Development Subprogram is to improve the energy and environmental performance of distributed technologies so that the Nation can have more energy choices to achieve a more flexible and smarter energy system. The Technology Development area focuses on a portfolio of electricity generation technologies as well as heat utilization technologies and focuses on efficiency, emissions, RAMD (reliability, availability, maintainability and durability) and cost targets.

Benefits

This subprogram provides the high-risk R&D on technology development such as combustion, materials, system design, thermal recovery and failure analysis to develop the next generation high-efficiency, low emission technologies for industrial gas turbines, microturbines, and reciprocating engines as well as thermally activated technologies. The program is developing a better understanding of fluid dynamics, the combustion and flame stability process, heat/mass transfer, materials processing and system design. Balancing the need for near-zero NO_x emissions, high-efficiency at a low-cost is a challenge that goes beyond incremental improvements. By improving the efficiency of thermally driven energy systems and advancing the efficiency and emissions characteristics of power generation technologies, the Distributed Generation Technology Development Subprogram provides the building blocks necessary to develop advanced integrated systems envisioned in the program goal. Indicators of progress toward achieving this goal include measures of emissions and efficiency, as set out below:

Historic and Planned Results (verified by rig or prototype engine testing)

(Percent/Low Heating Value)

Efficiency	Historic				Planned			
	2001	2002	2003	2004	2005	2006	2007	2008
Microturbines								
Target	28	--	33	33	35	--	--	37
Actual	28	--	33	34	--	--	--	--
Reciprocating Engines								
Target	38	--	39	42	44	44	44	47
Actual	38	39	39	43	--	--	--	--

(lb/MWh)

Emissions	Historic				Planned			
	2001	2002	2003	2004	2005	2006	2007	2008
Industrial Turbines								
Target	0.35	--	--	0.25	--	0.18	--	0.15
Actual	0.35	0.35	0.35	0.30	--	--	--	--
Microturbines								
Target	0.70	--	0.30	--	--	--	--	0.15
Actual	0.70	0.50	0.40	0.30	--	--	--	--
Reciprocating Engines								
Target	3.10	--	--	--	1.50	--	--	0.15
Actual	3.10	3.10	3.10	1.60	--	--	--	--

Detailed Justification

	(dollars in thousands)		
	FY 2004	FY 2005	FY 2006
Industrial Gas Turbines.	**3,950**	**2,958**	**2,500**

Industrial gas turbines are used in many industrial and commercial applications ranging from 1MW to 20MW. A key effort in the Industrial Gas Turbine research has been to enhance the efficiency and environmental performance of gas turbines for applications up to 20MW. The focus of this effort is to advance materials research, such as composite ceramics and associated environmental barrier coatings, which will continue to improve performance and durability. This builds upon previous research to test and demonstrate innovative high temperature materials such as prime reliant coatings, silicon carbide/silicon carbide fiber composites, oxide composites, and silicon nitride ceramics. The turbine strategy is to selectively test various ceramic turbine components (blades, vanes, nozzles, injector tips, shrouds and combustor liners) and document performance and durability. Efficiency gains can be achieved with materials like ceramics, which allow a significant increase in engine operating temperature and reduce cooling air. This research builds on prior year efforts which focused on developing combustor liners, blades and vanes. Recent data has revealed that water vapor in gas turbine environments corrodes ceramics. Water-vapor attack on the ceramics has moved this research to increasingly focus on environmental barrier coating activities. Endurance testing activities of monolithic ceramic blades and vanes for industrial gas turbine components were discontinued leading the program to focus on more basic ceramic environmental barrier coating development research.

The research activities build on material performance data from the planned FY 2005 field test of ceramic composite shrouds as well as continued long-term testing of coated ceramic composite combustor liners. The composite shroud test data will document the performance gains and benefits of ceramic shroud technology, leading the program to continue long-term viability testing ceramic of ceramic composite components. These activities support a long-term high risk objective to conduct an all ceramic hot section in an industrial gas turbine at 2400 degrees F.

Building on the demonstration of low emissions technology in FY 2005 (0.25lbs/MWhr), long-term viability testing will continue in FY 2006 showing greatly reduced NO_x and CO produced without negatively impacting turbine performance. Turbine performance and emissions reduction benefits will be documented. The long-term goal of the activity is to achieve less than 0.15 lb/MWh in NO_x emissions by 2008. Continuation of the investigation on low emission measuring technologies is necessary due to the inability of conventional flue-gas emissions monitoring systems' to accurately measure low concentrations of pollutants (particularly nitrogen oxides). Building on the alternative NO_x prevention technologies and field test results from FY 2005, FY 2006 will provide a strategic evaluation of several advanced materials and low emissions technology paths to meet the FY 2008 goal.

Continue efforts to lower the manufacturing costs and enhancing the durability of ceramics, environmental barrier coatings and low emission combustion systems, and combustor designs for gas turbines. FY 2006 research will investigate new technology paths for improved turbine performance.

Research technology attributes will be compared to competing technologies to assess and quantify expected benefits and market acceptance. Additionally, DOE is closing out activities on thermal barrier coatings based on manufacturers' interest to invest in proprietary coatings. *Participants: Alzeta, Argonne National Laboratory (ANL), Catalytica, California Energy Commission, General Electric Power System Composites (GEPSC), General Electric Corporate Research & Development, Goodrich Corporation, Oak Ridge National Laboratory (ORNL), Precision Combustion, Inc., Siemens Westinghouse, Solar Turbines, United Technologies Research Center (UTRC), and Honeywell Engines and Systems.*

	FY 2004	FY 2005	FY 2006
Microturbines...	**6,704**	**6,201**	**5,685**

Microturbines are a new type of combustion turbine for use in distributed energy generation applications. About the size of a refrigerator, microturbines produce 25 to 500 kW of energy and can be located on sites with limited space for power production. Waste heat recovery can be used in combined cooling, heating, and power (CHP) systems. Microturbines offer many advantages over other technologies for small-scale power generation, including the ability to provide reliable backup power, provide power for remote locations, and peak shave. Other advantages include less maintenance and longer lifetimes because of a small number of moving parts, compact size, lighter weight, greater efficiency, lower emissions, and quick starting. Microturbines also offer opportunities to use waste fuels such as landfill gas. The microturbine research will lead a national effort to design, develop, test, and demonstrate a new generation of microturbines for distributed applications that are cleaner, more affordable, reliable, and efficient than products that are currently available. The goal of the microturbine research is to achieve 37 percent efficiency with less than 7 ppm NO_x (approximately 0.15 lb/MWh) at a competitive cost by 2008. Ultimately, the program seeks to demonstrate a microturbine with 40 percent efficiency.

Research in FY 2006 specifically will test key subsystems and components to validate engineering pathways such as bottoming cycles and high temperature microturbine hot section components incorporating ceramics to achieve microturbine system goals of 37 percent efficiency with single digit emission by 2008. Promising subsystems will be integrated into prototype engine test beds to determine operability, durability, and performance benefits. FY 2006 research will continue to investigate technology pathways to meeting low emission environmental targets including addressing issues with part-load performance and combustion sensitivities to fuel variations. Additionally, technology readiness and advancements will be evaluated with respect to current state of the art and end use applications. The contract on recuperator design and development has been closed out because of a lack of a supplier. In FY 2004, this activity was reduced by $210,000 for SBIR/STTR and transferred to the Science Appropriation. *Participants: Argonne National Laboratory (ANL), Capstone Turbine Corporation, California Energy Commission, Honeywell Engines and Systems (ES), Ingersoll-Rand, Oak Ridge National Laboratory (ORNL), Solar Turbines, Southern California Edison (SCE), United Technologies Research Center (UTRC), and General Electric Corporate Research & Development.*

	(dollars in thousands)		
	FY 2004	FY 2005	FY 2006
Advanced Reciprocating Engines	**13,408**	**13,608**	**10,000**

Gas-fired reciprocating engines offer a wide range of power generation at an economical cost over other technologies. With their operating flexibility, reciprocating engines can be used for many purposes, such as local power grid and substation support, peak-shaving, remote power, on-site generation, combined cooling, heating, and power (CHP) applications, high-density electric loads, standby power, and as mechanical drives used for compressors and pumps in industrial, commercial, institutional, and residential applications. The Advanced Reciprocating Engine System (ARES) will lead a national effort to design, develop, test, and demonstrate a new generation of gas-fired reciprocating engines for Distributed Energy applications that are cleaner, more affordable, reliable, and efficient than products that are commercially available today. The goal of the research is to achieve a 47 percent efficient reciprocating engine system with less than 0.15 lb/MWh of NO_x emissions at a competitive cost by 2008. Ultimately, the program seeks to achieve 50 percent efficiency.

Continue research in the ARES project (three prime contractors, National Laboratory activities and university consortium) to meet the program goals and will focus on critical system design needs to meet Phase 2 targets of 47 percent efficiency and 0.15 lb/MWh of NO_x. The program will build on the initial designs, research, and testing from Phase I. With assistance and guidance from industry, universities, and laboratory research, the effort will develop and integrate critical components to the engine platform. Efforts will focus on additional power density, parasitic reduction, advanced air handling systems, improved cylinder designs, and new ignition systems as well as exhaust gas recirculation (EGR). Investigation will continue on the viability of a novel natural gas-fired Homogeneous Charge Compression Ignition (HCCI) (closed-loop controllers) and modified HCCI combustion systems, to meet the 50 percent efficiency target and reduce NO_x considerably. This research will benefit from the synergies of the program's cooperative efforts with the Vehicle Technologies program, which focuses on diesel and gasoline HCCI research. The university projects will continue to focus on ignition processes in large engines using laser and spark ignition, low engine friction technology for ignition improvement for lean gas mixtures, parasitic loss control through surface modification, reduced engine friction and wear, selective NO_x re-circulation for stationary lean-burn natural gas engines, thermal management via active flow control, and two stage catalytic reduction of NO_x. Research environmental issues, distributed energy modeling and technology impacts will continue.

The free piston activities (rapid combustion generator) under the reciprocating engine program was dropped in FY 2005 because of its low ranking in the December 2003 peer review. In FY 2004, this activity was reduced by $420,000 for SBIR/STTR and transferred to the Science Appropriation. *Participants: Argonne National Laboratory (ANL), Caterpillar, Colorado State University, Cummins Engine Co., Inc, Los Alamos National Laboratory (LANL), Massachusetts Institute of Technology, Michigan Technological University, National Energy Technology Laboratory (NETL), Northwestern University, Oak Ridge National Laboratory (ORNL), Ohio State University, Pacific Northwest National Laboratory (PNNL), Purdue University, Sandia National Laboratory (SNL), University of Southern California (USC), University of Tennessee, University of Texas at Austin, Waukesha Engine, Dresser, Inc., and West Virginia University.*

	(dollars in thousands)		
	FY 2004	FY 2005	FY 2006
Technology Based – Advanced Materials and Sensors. . . .	**7,999**	**9,150**	**8,300**

Advanced materials, such as ceramics and environmental barrier coatings and sensors are some of the key enabling technologies for heat exchangers (recuperation), combustion (combustor liners, spark plugs), and operation of stationary industrial gas turbines, microturbines and reciprocating engines to improve the efficiency and reduce emissions. Engineered ceramics, such as ceramic matrix composites offer all of the advantages of ceramics-resistant to heat, corrosion, erosion, and chemical activity-while adding strength and thermal shock resistance that conventional ceramics do not demonstrate. Unfortunately, ceramics are prone to water vapor attack and degradation. Building on work begun in FY 2005 to fundamentally understand recession in ceramics due to this water-vapor attack, characterization of environmental barrier coatings (adherence and quality) will continue through material property testing and microscopic analysis. Activities will continue to focus on developing partnerships with industry to utilize National Laboratory specialized technical skills and facilities to further understand, analyze and develop advanced material and sensor solutions to increase performance, reduce emissions and enhance reliability, availability, maintainability and durability of distributed generation technologies. Activities also focus on gaining further understanding of the fundamental science around high-temperature corrosion and erosion and developing engineering solutions to mitigate the issues.

Continue work with microturbine manufacturers and metal suppliers to develop and characterize advanced recuperator materials to operate at higher temperature with long term durability. Continue testing and evaluation of ceramic components and associate environmental barrier coatings to determine structure-property relationships during exposure in gas turbine environments. Continue evaluation of spark plug corrosion in partnership with the engine manufacturers. Initiate additional activities utilizing National Laboratories capabilities related to turbines, microturbines and engines. In FY 2004, this activity was reduced by $156,200 for SBIR/STTR and transferred to the Science Appropriation. *Participants: Allegheny Ludlum, Argonne National Laboratory (ANL), Capstone Turbine Corporation, Connecticut Reserve Technology, LLC, Cummins Engine Co., Inc, Haynes International, Honeywell Engines and Systems, Ingersoll-Rand, Kennametal Inc., General Electric Power System Composites (GEPSC), and Oak Ridge National Laboratory (ORNL), Poco Graphite, Inc., Saint-Gobain Ceramics and Plastics, University of Dayton Research Institute (UDRI), United Technologies Research Center (UTRC), and Solar Turbines.*

Fuel Combustion (formally Fuel Flexibility)......................	**0**	**739**	**1,000**

Based on a completed assessment of fuel issues and opportunities in FY 2005 and an evaluation of capabilities at the National Laboratory activities, the program will conduct a focused combustion solicitation to evaluate the long-term combustion technologies for low-emissions such as rich combustion, lean-burn combustion, and solonox, focusing on the next-generation of dual fuels (gaseous or liquid) such as propane, digester, land-fill methane, town gas, refinery gas, process natural gas, syngas, associated gas, natural gas liquids, raw natural gas and other variations. Laboratory research will evaluate fuel characteristics and affects of fuel variations on the distributed generation equipment for long-term availability and durability. No efforts in this activity will work on fuel development. *Participants: TBD.*

	(dollars in thousands) FY 2004	FY 2005	FY 2006
Thermal Energy Technologies (formally Thermally Activated Technologies)	**7,436**	**6,666**	**8,000**

Thermal Energy Technologies use the recoverable heat from gas-fired systems and rejected/waste heat from industrial processes or electricity generation. These technologies provide important keys for achieving the overall efficiency benefits of distributed energy technologies by converting natural gas, exhaust, or rejected heat into useful energy services like heating, cooling, humidity control, thermal storage, or bottoming cycles. Utilizing thermal energy is an essential building block for CHP. The Thermal Energy effort facilitates research, development, testing, and integration of advanced heating, cooling, dehumidification, and refrigeration equipment.

The program will conduct and implement a new solicitation to develop industry partnerships on advanced thermal technologies (e.g. air-cooled absorption chillers and desiccants). Oak Ridge National Laboratory will continue research efforts on heat and mass transfer/heat exchangers. The National Renewable Energy Laboratory will continue to support the desiccant industry through testing at the thermal energy conversion laboratory and test a prototype air quality sensor. In FY 2004, this activity was reduced by $129,800 for SBIR/STTR and transferred to the Science Appropriation. *Participants: Ambian Climate Technologies, Carrier Corporation, Gas Technology Institute (GTI), Georgia Tech Research Institute (GTRI), Kathabar, Inc., Mississippi State University, Munters, National Renewable Energy Laboratory (NREL), Oak Ridge National Laboratory (ORNL), Trane, Rocky Research, University of Central Florida, York International, and United Technologies Research Center (UTRC).*

Total, Distributed Generation Technology Development	**39,497**	**39,322**	**35,485**

Explanation of Funding Changes

	FY 2006 vs. FY 2005 ($000)
Industrial Gas Turbines	
The program is closing out the thermal barrier coating activities, as the program has reached the transition point wherein any further development of this technology is now within the capability of industry. The program management decision to close out this effort is consistent with management application of RDIC, as set out in Section 2e, and the PART recommendations. Section 2e of the RDIC addresses how well each plan incorporates “offramps” and “endpoints” in the research activity planning.	-458

	FY 2006 vs. FY 2005 ($000)
Microturbines	
The program is closing out the recuperator design and development project, as the program has reached the transition point wherein any further development of this technology is now within the capability of industry. The program management decision to close out this program is consistent with management application of Research Development Investment Criteria (RDIC), as set out in Section 2e, and the PART recommendations. Section 2e of the RDIC addresses how well each plan incorporates "offramps" and "endpoints" in the research activity planning.	-516
Advanced Reciprocating Engines	
The program is reducing the scope of industrial contracts, as the program has reached the transition point where less cofunded work is necessary to achieve the program's objectives. The program management decision to begin ramping down this effort is consistent with management application of RDIC, as set out in Section 2e, and the PART recommendations. Section 2e of the RDIC addresses how well each plan incorporates "offramps" and "endpoints" in the research activity planning.	-3,608
Technology Based – Advanced Materials and Sensors	
The program is closing out the industrial research efforts in thermal barrier coatings, as the program has reached the transition point where the technology is sufficiently mature and additional composite coatings research will be of sufficiently proprietary in nature that any further development of this technology should be carried out by industry. The program management decision to transfer this research to industry is consistent with management application of RDIC, as set out in Section 2e, and the PART recommendations. Section 2e of the RDIC addresses how well each plan incorporates "offramps" and "endpoints" in the research activity planning.	-850
Fuel Combustion	
Increase to initiate focused solicitation on multi-fuel combustion activities for distributed generation technologies to meet efficiency goals with dual-fuels	+261
Thermal Energy Technologies	
Increased funding will support a new solicitation in partnership with industry on desiccants, air-cooled absorption chillers and other thermally-driven equipment	+1,334
Total Funding Change, Distributed Generation Technology Development	**-3,837**

End-Use System Integration and Interface

Funding Schedule by Activity

(dollars in thousands)

	FY 2004	FY 2005	FY 2006	$ Change	% Change
End-Use System Integration and Interface					
Distributed Energy Systems Applications Integration					
Distributed Energy Systems Applications Integration	7,026	7,751	8,500	+749	+9.7%
Congressionally Directed Activity, Distributed Energy Systems Applications Integration	988	986	0	-986	-100.0%
Subtotal, Distributed Energy Systems Applications Integration	8,014	8,737	8,500	-237	-2.7%
Cooling, Heating and Power Integration	11,662	11,834	12,000	+166	+1.4%
Total, End-Use System Integration and Interface	19,676	20,571	20,500	-71	-0.3%

Description

Distributed energy devices provide utilities and consumers with more choices and control over how their energy needs are met, and are essential for more openly competitive electricity and natural gas markets to flourish. The focus of the End-Use Integration and Interface activities is to develop highly-efficient integrated energy systems that can be replicated across end-use sectors which will help demonstrate a R&D objective or address a technical barrier.

Benefits

This subprogram develops the knowledge base and technologies necessary to integrate energy systems efficiently in end-use applications. The focus is on heat/mass transfer, air/fluid flows, optimizing performance, adaptive controls for building load management, and sensors/communications technologies for use with building energy systems. The End-Use System Integration and Interface Subprogram integrates the technologies developed in the Distributed Generation Technology Development Subprogram into the efficient packaged systems envisioned in the program goal. An indicator of the progress toward achieving this goal is the number of successful integrated system demonstrations, on the following chart:

Historic and Planned Results

Cumulative # Successful Demonstration	Historic				Planned			
	2001	2002	2003	2004	2005	2006	2007	2008
Target	0	0	0	0	1	--	2	3
Actual	0	0	1	1				

Detailed Justification

(dollars in thousands)

	FY 2004	FY 2005	FY 2006
Distributed Energy Systems Applications Integration	**8,014**	**8,737**	**8,500**
▪ **Distributed Energy Systems Applications Integration**	**7,026**	**7,751**	**8,500**

This activity facilitates acceptance of distributed energy resources (DER) in end-use sectors by forming partnerships with industry consortiums in the light industrial, supermarkets, hospitality, education and healthcare sectors. These industries represent a high potential for DER due to the high reliability and power quality requirements and related large cooling loads. Projects include development of decision and design tools and integration of DER technologies at customer sites to meet power and thermal needs and quantify value (such as energy and emissions benefits, installation and retrofit costs and high efficiency, reliability, etc.). Results from these assessments are disseminated as information and education materials among the industries, utilities and States.

Projects will continue from the FY 2004 solicitation (healthcare, supermarkets, hotels and education sectors) and progress in FY 2006. Each project will 1) quantify the energy and emissions benefits and installation and retrofit costs, and other benefits; 2) research integration issues and recommend improvements for developing a 70 percent model efficiency system; and 3) correlate data to analytical models and tools for end use customers. Research will include activities on electronics and supervisory control strategies to better optimize electrical and thermal needs and synchronize with the grid.

R&D issues in using distributed energy as a resource for upgrading and supporting the distribution system to improve capacity will be investigated. Work will be initiated with the distribution system operators to resolve technical issues. Existing building interface issues will be evaluated to understand the electrical boundaries for distributed technologies, working in cooperation with the grid (e.g. actions required by the distributed technologies in response to grid disturbances). The high-tech industry (data centers) activities will be closed-out due to low scoring from the peer review and closure of one contract. Based on recommendations from the December 2003 peer review the end-use integration activities will be prioritized by “market sectors” vs. individual projects.

Activities will continue in the Regional Offices in support of Distributed Energy focusing on regionally specific technology and market issues such as interconnection standards, market design (rate structures) that will support replication of distributed technologies. In FY 2004, this activity was reduced by $220,000 for SBIR/STTR and transferred to the Science Appropriation. *Participants: American Gas Association, Capstone Turbine Corporation, Energy Solutions Center, Exergy Partners, Gas Technology Institute (GTI), New York State Energy Research and Development Authority (NYSERDA), National Accounts Energy Alliance, Oak Ridge National Laboratory (ORNL) and the National Renewable Energy Laboratory.*

	FY 2004	FY 2005	FY 2006
▪ **Congressionally Directed Activity, Distributed Energy Systems Application Integration**	**988**	**986**	**0**

National Accounts Energy Alliance (FY 2004 $987,640).

	FY 2004	FY 2005	FY 2006
Cooling, Heating and Power (CHP) Integration	**11,662**	**11,834**	**12,000**

Cooling, Heating and Power Integration (CHP) reduces energy costs and emissions by using energy resources more efficiently. In conventional conversion of fuel to electricity, over two-thirds of the energy input is discarded as heat to the environment and not used for productive purposes. CHP makes greater use of fuel inputs by utilizing the discarded heat with system potential efficiencies ranging from 60 to 80 percent. The industry's CHP Program goal, which DOE is supporting, is to double the capacity of CHP in the United States to 92 GW by 2010 and develop and test CHP packages for integration into overall building system design. Using the viable heat energy rejected from the making of electricity, high efficiencies can be achieved and package technologies can be integrated and optimized for end-use application. By capturing and using this rejected heat energy, these packaged systems could achieve efficiencies greater than 70 percent. The National CHP Roadmap will be used to guide the program's activities in the areas of raising awareness, eliminating environmental barriers and developing market and technology tools (analytical modeling and design of CHP systems. The activity will continue support of the Regional Application Centers and educational programs under the State Energy Programs (special projects). Specifically, these Regional Application Centers will promote and disseminate information on CHP and assist in implementation of CHP projects in the region. The program will develop a Regulatory Requirements Database for Small Electric Generators, develop a CHP emissions calculator, and develop an electric rate primer to assist in eliminating regulatory and institutional barriers. The program will also baseline CHP installations and markets and asses the technical and economic potential of CHP in specific markets and regions. Continue the development of case studies and evaluation of existing distributed generation site demonstration projects including landfills and other gaseous fuels to document technology issues, market issues and policy issues. Continue to analyze emissions data and emissions credits for CHP and propose guidance for future standards. Develop models for integration of CHP equipment to predict and optimize performance and thermal output. Continue to support the Regional Office's efforts on emission standards. The data and information from these activities will be disseminated at the national and regional levels to aid in the installation of CHP facilities as well as available on the web. These projects will increase awareness of and confidence in CHP technologies including their benefits in efficiency and emissions.

	(dollars in thousands)		
	FY 2004	FY 2005	FY 2006

Continue combined heat and power research and development of a skid mounted packaged combined heat and power product referred to as an Integrated Energy System. These technologies will be engineered at the factory, not on-site. Building on previous research, the CHP activity will complete the six phase I projects including demonstrations at Ft. Bragg, North Carolina and Austin, Texas, down-select and continue phase II efforts through FY 2006. These efforts will focus on tighter packaging (less energy loss, lower installed cost, improved operability and reliability), increased thermal optimization, modularity (including the design of a family of products for wider range of sizes) and smaller footprint. Testing and data collection will continue through FY 2006. In parallel, some contracts will progress on to Phase II, which entails fabrication of upgraded systems incorporating changes received from testing and evaluation. Systems range from 60kW to 5.2 megawatt gas fired turbines using recoverable energy delivered to absorption chiller in the 20 to 2500 RT chillers and liquid or solid desiccant systems. One project couples the recoverable heat from a 500W internal combustion engine to an ammonia/water absorption unit for supermarket cold storage or frozen food cases. A computer model is being developed that will assist companies in the design, energy analysis, and cost of CHP systems.

Based on four studies completed on FY 2005, evaluate go/no-go decision based on market/technology performance and economic criteria on microCHP package residential systems to continue to Phase II, system design. Decision to proceed will be based on cost-effectiveness, efficiency, market potential and the ability to mass-manufacturer. In FY 2004, this activity was reduced by $189,860 for SBIR/STTR and transferred to the Science Appropriation. *Participants: American Council for Energy Efficient Economy (ACEEE), American Gas Association (AGA), Broad USA, Burns & McDonnell, Capstone Turbine Corporation, Carrier Corporation, Caterpillar, Cummins, Distributed Utility Associates. Energy and Environmental Analysis, Inc. (EEA), Energetics, Energy Concepts Co., LLC, Exergy Partners, Gas Technology Institute, Honeywell Laboratories, I C Thomasson Associates, Inc., Ingersoll-Rand, International District Energy Association (IDEA), Northeast-Midwest Institute (NEMW), NiSource, Oak Ridge National Laboratory (ORNL), Resource Dynamics, Solar Turbines, TIAX, Trane, United Technologies Research Center (UTRC), University of Maryland, University of Chicago – Illinois, California Energy Commission, University of California-Berkley, University of California- Irvine, San Diego State University, New York State Energy Research and Development Authority (NYSERDA), Pace University, University of Massachusetts-Amherst, Rutgers University, West Virginia University, US Combined Heat and Power Association, Washington State University, and Waukesha Engine, Dresser, Inc.*

Total, End-Use System Integration and Interface	**19,676**	**20,571**	**20,500**

Explanation of Funding Changes

	FY 2006 vs. FY 2005 ($000)
Distributed Energy Systems Applications Integration	
▪ **Distributed Energy Systems Applications Integration**	
The increase in funding will support building cooling, heating and power integration systems research on electronics and electrical testing to better manage electrical and thermal needs. Increased emphasis on systems work was recommended in OMB's evaluation of DER's PART scores, and this decision is consistent with the R&D Investment Criteria, section 2a. Section 2a of the RDIC addresses how well each plan builds on existing technology and complements related R&D activities..	+749
▪ **Congressionally Directed Activity, Distributed Energy Systems Applications Integration**	
Complete Congressionally-directed activity and focus on activities contributing to program goals.	-986
Total, Distributed Energy Systems Applications Integration	**-237**
Cooling, Heating and Power Integration	
The increase in funding will support additional work at the regional application centers and augment integrated micro-CHP systems work.	+166
Total Funding Change, End-Use System Integration and Interface	**-71**

Technical/Program Management Support

Funding Schedule by Activity

	(dollars in thousands)				
	FY 2004	FY 2005	FY 2006	$ Change	% Change
Technical/Program Management Support	511	523	644	+121	+23.1%
Total, Technical/Program Management Support	511	523	644	+121	+23.1%

Description

The addition of distributed energy resources as a power choice is a complex issue. This task forms the technical foundation that assists and guides the DER research activities to ensure relevance to the market. Markets, technology advances, and regulations are dynamic, and this task continually monitors available information and adjusts the program direction as necessary to be responsive.

Benefits

The Technical/Program Management Subprogram (TPMS) provides the analysis framework and technical support to meet the requirements of Department's planning process, Congress, GPRA, and PART (planning, management and purpose). This subprogram also analyzes program gaps and new R&D opportunities. This planning and management analysis is necessary to keep the program's research agenda on target to meet the program goal in the face of dynamic market and technology developments.

Detailed Justification

	(dollars in thousands)		
	FY 2004	FY 2005	FY 2006
Technical/Program Management Support	**511**	**523**	**644**

The TPMS will support activities which are an integral part of the distributed generation technology development and end-use systems integration. Activities will include preparation of program strategic plans, multi-year plans, technology roadmaps, and operating plans, peer reviews, development of web-based technical information and technical workshop/conferences specific to Distributed Energy Resources Technology Development and End-Use Systems Integration, technical/program data collection (Corporate Planning System – CPS and related databases) and methodology to support DER performance goals, DER technology assessments and market status. This will also support analysis undertaken to address Government Performance and Results Act and the President's

	(dollars in thousands)		
	FY 2004	FY 2005	FY 2006
Management Agenda requirements, including the Performance Assessment Rating Tool and the Research and Development Investment Criteria. *Participants include: Energetics, LBNL, BCS, and Sentech.*			
Total, Technical/Program Management Support........	**511**	**523**	**644**

Explanation of Funding Changes

	FY 2006 vs. FY 2005 ($000)
Technical/Program Management Support	
Increases will support analytical activities (e.g., New York and PJM) to document the costs and benefits of distributed generation/CHP as a resource to the grid system..........	+121
Total Funding Change, Technical/Program Management Support...........................	**+121**